DESIGN WORKSHEETS

ONSITE SEWAGE TREATMENT PROGRAM

Preliminary Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Contact Information

v 04.01.2021

Property Owner/Client:	Prairie River Retreat	Date Completed:	5/3/2023
Site Address:	51272 Lake Ave McGregor, MN 55760	Project ID:	
Email:	darlowexc@hotmail.com - installer	Phone:	218-426-0010
Mailing Address:	Grand Timber Bank PO Box 220 McGregor, MN 55760	Alt Phone:	
Legal Description:			

Parcel ID: 29-1-370500 SEC: 3 TWP: 49 RNG: 23

2. Flow and General System Information

A. Client-Provided Information

Project Type: ☐ New Construction ☑ Replacement ☐ Expansion ☐ Repair

Project Use: ☐ Residential ☑ Other Establishment: Tavern

Residential use: # Bedrooms: | Dwelling Sq.ft.: | Unfinished Sq. Ft.:

Adults: | # Children: | # Teenagers:

In-home business (Y/N): | If yes, describe:

Water-using devices: *(check all that apply)*

☐ Garbage Disposal/Grinder ☐ Dishwasher ☐ Hot Tub*
☐ Sewage pump in basement ☐ Water Softener* ☐ Sump Pump*
☐ Large Bathtub >40 gallons ☐ Iron Filter* ☐ Self-Cleaning Humidifier*
☐ Clothes Washing Machine ☐ High Eff. Furnace* ☐ Other:

* Clear water source - should not go into system

Additional current or future uses:

Anticipated non-domestic waste:

The above is complete & accurate: *Client signature & date*

B. Designer-determined flow Information

Attach additional information as necessary.

Design Flow: 750 GPD Anticipated Waste Type: Other Est. - HSW

BOD: 526 mg/L TSS 29 mg/L Oil & Grease 100 mg/L

3. Preliminary Site Information

A. Water Supply Wells

#	Description	Mn. ID#	Well Depth (ft.)	Casing Depth (ft.)	Confining Layer	STA Setback	Source
1	Deep			>50'			Owner
2							
3							
4							

Additional Well Information:

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MINNESOTA POLLUTION CONTROL AGENCY

Site within 200' of noncommunity transient well (Y/N)	No	Yes, source:	
Site within a drinking water supply management area (Y/N)	No	Yes, source:	
Site in Well Head Protection inner wellhead management zone (Y/N)	No	Yes, source:	
Buried water supply pipes within 50 ft of proposed system (Y/N)	No		
B. Site located in a shoreland district/area?	No	Yes, name:	
Elevation of ordinary high water level:	ft	Source:	
Classification:	Tank Setback: ft.	STA Setbk: ft.	
C. Site located in a floodplain?	No	Yes, Type(s):	N/A
Floodplain designation/elevation (10 Year):	N/A ft	Source:	N/A
Floodplain designation/elevation (100 Year):	N/A ft	Source:	N/A

D. Property Line Id / Source: ☑ Owner ☐ Survey ☑ County GIS ☐ Plat Map ☐ Other:

E. ID distance of relevant setbacks on map: ☐ Water ☐ Easements ☑ Well(s) ☑ Building(s) ☑ Property Lines ☐ OHWL ☐ Other:

4. Preliminary Soil Profile Information From Web Soil Survey (attach map & description)

Map Units: 454C Mahtomedi loamy coarse sand — Slope Range: 6-12 %

List landforms: Outwash Plains

Landform position(s): Backslope

Parent materials: Sandy and gravelly outwash

Depth to Bedrock/Restrictive Feature: 24 in — Depth to Watertable: in

Map Unit Ratings

Septic Tank Absorption Field- At-grade:

Septic Tank Absorption Field- Mound:

Septic Tank Absorption Field- Trench:

5. Local Government Unit Information

Name of LGU: Aitkin County

LGU Contact: 218-927-7342

LGU-specific setbacks:

LGU-specific design requirements:

LGU-specific installation requirements:

Notes:

ONSITE SEWAGE TREATMENT PROGRAM

Field Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Project Information

v 04.01.2021

Property Owner/Client: Prairie River Retreat | Project ID:

Site Address: 51272 Lake Ave McGregor, MN 55760 | Date Completed: 5/3/2023

2. Utility and Structure Information

Utility Locations Identified ☐ Gopher State One Call # ☐ Any Private Utilities:

Locate and Verify (*see Site Evaluation map*) ☑ Existing Buildings ☐ Improvements ☐ Easements ☑ Setbacks

3. Site Information

Vegetation type(s): Forest | Landscape position: Back/ Side Slope

Percent slope: 12 % | Slope shape: | Slope direction:

Describe the flooding or run-on potential of site:

Describe the need for Type III or Type IV system:

Note: Type V - Wexco Flex MBBR

Proposed soil treatment area protected? (Y/N): Yes | If yes, describe: Staked

4. General Soils Information

Filled, Compacted, Disturbed areas (Y/N): No

If yes, describe:

Soil observations were conducted in the proposed system location (Y/N): Yes

A soil observation in the most limiting area of the proposed system (Y/N): Yes

Number of soil observations: 3 | Soil observation logs attached (Y/N): Yes

Percolation tests performed & attached (Y/N): No

5. Phase I. Reporting Information

	Depth		Elevation		
Limiting Condition*:	24	in	100.5	ft	**Most Restrictive Depth Identified from List Below*
Periodically saturated soil:	24	in	100.5	ft	Soil Texture: Loamy Fine Sand
Standing water:		in		ft	Percolation Rate: min/inch
Bedrock:		in		ft	Soil Hyd Loading Rate: 0.6 gpd/ft^2
Benchmark Elevation:	100.0	ft			Elevations and Benchmark on map? (Y/N): Yes

Benchmark Elevation Location: Top of screw in tree

Differences between soil survey and field evaluation:

Site evaluation issues / comments:

Anticipated construction issues:

University of Minnesota Onsite Sewage Treatment Program

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MINNESOTA POLLUTION CONTROL AGENCY

1. PROJECT INFORMATION

v 04.01.2021

Property Owner/Client:	Prairie River Retreat	Project ID:	
Site Address:	51272 Lake Ave McGregor, MN 55760	Date:	
Email Address:	darlowexc@hotmail.com - installer	Phone:	218-426-0010

2. DESIGN FLOW & WASTE STRENGTH

Attach data / estimate basis for Other Establishments

Design Flow: 750 GPD — Anticipated Waste Type: Other Est. - HSW

BOD: 526 mg/L — TSS: 29 mg/L — Oil & Grease: 100 mg/L

Treatment Level: C — *Select Treatment Level C for residential septic tank effluent*

3. HOLDING TANK SIZING

Minimum Capacity: Residential =400 gal/bedroom, Other Establishment = Design Flow x 5.0, Minimum size 1000 gallons

Code Minimum **Holding Tank** Capacity: ____ Gallons in ____ Tanks or Compartments

Recommended **Holding Tank** Capacity: ____ Gallons in ____ Tanks or Compartments

Type of High Level Alarm: ____ (Set @ 75% tank capacity)

Comments: ____

4. SEPTIC TANK SIZING

A. Residential dwellings:

Number of Bedrooms (Residential): ____

Code Minimum **Septic Tank** Capacity: ____ Gallons in ____ Tanks or Compartments

Recommended **Septic Tank** Capacity: ____ Gallons in ____ Tanks or Compartments

Effluent Screen & Alarm (Y/N): ____ Model/Type: ____

B. Other Establishments:

Waste received by: Gravity — 750 GPD x 3 Days Hyd. Retention Time

Code Minimum **Septic Tank** Capacity: 2250 Gallons In 1 Tanks or Compartments

Recommended **Septic Tank** Capacity: 2250 Gallons In 2 Tanks or Compartments

Effluent Screen & Alarm (Y/N): Optional Model/Type: ____

5. PUMP TANK SIZING

Pump Tank 1 Capacity (Minimum):	750 Gal	Pump Tank 2 Capacity (Minimum):	Gal
Pump Tank 1 Capacity (Recommended):	1820 Gal	Pump Tank 2 Capacity (Recommended):	Gal
Pump 1: 37.0 GPM Total Head	27.8 ft	Pump 2: GPM Total Head	ft
Supply Pipe Dia.: 2.00 in Dose Vol:	125.0 gal	Supply Pipe Dia.: Dose Vol:	Gal

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MINNESOTA POLLUTION CONTROL AGENCY

6. SYSTEM AND DISTRIBUTION TYPE

Project ID:

Soil Treatment Type:	Mound	Distribution Type:	Pressure Distribution-Level
Elevation Benchmark:	100 ft	Benchmark Location:	Top of screw in tree
MPCA System Type:	Type IV	Distribution Media:	Rock
Type III/IV/V Details:	MBBR pretreatment unit		

7. SITE EVALUATION SUMMARY:

Describe Limiting Condition: Redoximorphic Features/Saturated Soils

Layers with >35% Rock Fragments? (yes/no) No If yes, describe below: % rock and layer thickness, amount of soil credit and any additional information for addressing the rock fragments in this design.

Note:

	Depth		Depth		Elevation of Limiting Condition	
Limiting Condition:	24	inches	2.0	ft	100.50	ft
Minimum Req'd Separation:	36	inches	3.0	ft		
					Elevation	
Code Max System Depth:	Mound	inches	-1.0	ft	103.50	ft

Critical for system compliance

This is the maximimum depth to the bottom of the distribution media for required separation. Negative Depth (ft) means it must be a mound.

Soil Texture:	Loamy Fine Sand		
Soil Hyd. Loading Rate:	0.60 GPD/ft^2	Percolation Rate:	MPI
Contour Loading Rate:	12	Note:	
Measured Land Slope:	12 %	Note:	
Comments:			

8. SOIL TREATMENT AREA DESIGN SUMMARY

Trench:

Dispersal Area	ft^2	Sidewall Depth	in	Trench Width	ft
Total Lineal Feet	ft	No. of Trenches		Code Max. Trench Depth	in
Contour Loading Rate	ft	Minimum Length	ft	Designed Trench Depth	in

Bed:

Dispersal Area	ft^2	Sidewall Depth	in	Maximum Bed Depth	in
Bed Width	ft	Bed Length	ft	Designed Bed Depth	in

Mound:

Dispersal Area	630.0 ft^2	Bed Length	63.0 ft	Bed Width	10.0 ft
Absorption Width	20.0 ft	Clean Sand Lift	1.0 ft	Berm Width (0-1%)	ft
Upslope Berm Width	6.3 ft	Downslope Berm	18.9 ft	Endslope Berm Width	12.1 ft
Total System Length	87.2 ft	System Width	35.2 ft	Contour Loading Rate	12.0 gal/ft

ONSITE SEWAGE TREATMENT PROGRAM

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MINNESOTA POLLUTION CONTROL AGENCY

At-Grade:

Bed Width	ft	Bed Length	ft	Finished Height	ft
Contour Loading Rate	gal/ft	Upslope Berm	ft	Downslope Berm	ft
Endslope Berm	ft	System Length	ft	System Width	ft

Level & Equal Pressure Distribution

No. of Laterals	3	Perforation Spacing	3 ft	Perforation Diameter	3/16 in
Lateral Diameter	2.00 in	Min Dose Volume	124 gal	Max Dose Volume	188 gal

Non-Level and Unequal Pressure Distribution

	Elevation (ft)	Pipe Size (in)	Pipe Volume (gal/ft)	Pipe Length (ft)	Perf Size (in)	Spacing (ft)	Spacing (in)
Lateral 1							
Lateral 2							
Lateral 3							
Lateral 4							
Lateral 5							
Lateral 6							

Minimum Dose Volume: gal

Maximum Dose Volume: gal

9. Additional Info for At-Risk, HSW or Type IV Design

A. Starting BOD Concentration = Design Flow X Starting BOD (mg/L) X 8.35 ÷ 1,000,000

750 gpd X 526 mg/L X 8.35 ÷ 1,000,000 = 3.29 lbs. BOD/day

B. Target BOD Concentration = Design Flow X Target BOD (mg/L) X 8.35 ÷ 1,000,000

750 gpd X 125 mg/L X 8.35 ÷ 1,000,000 = 0.78 lbs. BOD/day

Lbs. BOD To Be Removed: 2.51

PreTreatment Technology: Wexco Flex MBBR *Must Meet or Exceed Target

Disinfection Technology: *Required for Levels A & B

C. Organic Loading to Soil Treatment Area:

125 mg/L X 750 gpd x 8.35 ÷ 1,000,000 ÷ 630 ft^2 = 0.00124 lbs./day/ft^2

10. Comments/Special Design Considerations:

I hereby certify that I have completed this work in accordance with all applicable ordinances, rules and laws.

Brian Koski		2624	5/3/23
(Designer)	(Signature)	(License #)	(Date)

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ONSITE SEWAGE TREATMENT PROGRAM

Mound Design Worksheet
≥1% Slope

MINNESOTA POLLUTION CONTROL AGENCY

1. SYSTEM SIZING: Project ID: v 04.01.2021

A. Design Flow:	750	GPD
B. Soil Loading Rate:	0.60	GPD/ft^2
C. Depth to Limiting Condition	2.0	ft
D. Percent Land Slope:	12.0	%
E. Design Media Loading Rate:	1.2	GPD/ft^2
F. Mound Absorption Ratio:	2.00	

Table I
MOUND CONTOUR LOADING RATES:

Measured Perc Rate	← OR →	Texture - derived mound absorption ratio		Contour Loading Rate:
≤ 60mpi	OR	1.0, 1.3, 2.0, 2.4, 2.6		≤12
61-120 mpi	OR	5.0		≤12
≥ 120 mpi*		>5.0*		≤6*

TABLE IXa

LOADING RATES FOR DETERMINING BOTTOM ABSORPTION AREA AND ABSORPTION RATIOS USING PERCOLATION TESTS

Percolation Rate (MPI)	Treatment Level C		Treatment Level A, A-2, B,	
	Absorption Area Loading Rate (gpd/ft^2)	Mound Absorption Ratio	Absorption Area Loading Rate (gpd/ft^2)	Mound Absorption Ratio
<0.1	-	1	-	1
0.1 to 5	1.2	1	1.6	1
0.1 to 5 (fine sand and loamy fine sand)	0.6	2	1	1.6
6 to 15	0.78	1.5	1	1.6
16 to 30	0.6	2	0.78	2
31 to 45	0.5	2.4	0.78	2
46 to 60	0.45	2.6	0.6	2.6
61 to 120	-	5	0.3	5.3
>120	-	-	-	-

*Systems with these values are not Type I systems. Contour Loading Rate (linear loading rate) is a recommended value.

2. DISPERSAL MEDIA SIZING

A. Calculate Dispersal Bed Area: Design Flow ÷ Design Media Loading Rate

750 GPD ÷ 1.2 GPD/ft^2 = 625 ft^2

If a larger dispersal media area is desired, enter size: 630 ft^2

B. Enter Dispersal Bed Width: 10.0 ft *Can not exceed 10 feet*

C. Calculate Contour Loading Rate: Bed Width X Design Media Loading Rate

10 ft^2 X 1.2 GPD/ft^2 = 12.0 gal/ft *Can not exceed Table 1*

D. Calculate Minimum Dispersal Bed Length: Dispersal Bed Area ÷ Bed Width

630 ft^2 ÷ 10.0 ft = 63.0 ft

If a larger dispersal media Length is desired, enter size: ft

3. ABSORPTION AREA SIZING

A. Calculate Absorption Width: Bed Width X Mound Absorption Ratio

10.0 ft X 2.0 = 20.0 ft

B. For slopes >1%, the Absorption Width is measured downhill from the upslope edge of the Bed.

Calculate Downslope Absorption Width: Absorption Width - Bed Width

20.0 ft - 10.0 ft = 10.0 ft

4. DISTRIBUTION MEDIA: Project ID:

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Select Dispersal Media: Rock

Enter Either A. or B.

A. Rock Depth Below Distribution Pipe

6 in

B. Registered Media

Registered Media Depth in

Check registered product information for specific application details and design

Specific Media Comments:

Design Summary Page

6. MOUND SIZING Project ID:

A. Clean Sand Lift: Required Separation - Depth to Limiting Condition = Clean Sand Lift (1 ft minimum)

3.0 ft - 2.0 ft = 1.0 ft Design Sand Lift (optional): ft

B. Upslope Height: Clean Sand Lift + Depth of Media +Depth to Cover Pipe+ Depth of Cover (1 ft)

1.0 ft + 0.50 ft + 0.33 ft + 1.0 ft = 2.8 ft

Land Slope %		0	1	2	3	4	5	6	7	8	9	10	11	12
Upslope Berm Ratio	3:1	3.00	2.91	2.83	2.75	2.68	2.61	2.54	2.48	2.42	2.36	2.31	2.26	2.21
	4:1	4.00	3.85	3.70	3.57	3.45	3.33	3.23	3.12	3.03	2.94	2.86	2.78	2.70

C. Select Upslope Berm Multiplier (based on land slope): 2.21

D. Calculate Upslope Berm Width: Multiplier X Upslope Mound Height

2.21 ft X 2.8 ft = 6.3 ft

E. Calculate Drop in Elevation Under Bed: Bed Width X Land Slope ÷ 100 = Drop (ft)

10.0 ft X 12.0 % ÷ 100 = 1.20 ft

F. Calculate Downslope Mound Height: Upslope Height + Drop in Elevation

2.8 ft + 1.20 ft = 4.0 ft

Land Slope %		0	1	2	3	4	5	6	7	8	9	10	11	12
Downslope Berm Ratio	3:1	3.00	3.09	3.19	3.30	3.41	3.53	3.66	3.80	3.95	4.11	4.29	4.48	4.69
	4:1	4.00	4.17	4.35	4.54	4.76	5.00	5.26	5.56	5.88	6.25	6.67	7.14	7.69

G. Select Downslope Berm Multiplier (based on land slope): 4.69

H. Calculate Downslope Berm Width: Downslope Multiplier X Downslope Height

4.69 x 4.0 ft = 18.9 ft

I. Calculate Minimum Berm to Cover Absorption Area: Downslope Absorption Width + 4 feet

10.0 ft + 4 ft = 14.0 ft

J. Design Downslope Berm = greater of 4H and 4I: 18.9 ft

K. Select Endslope Berm Multiplier: 3.00 *(usually 3.0 or 4.0)*

L. Calculate Endslope Berm X Downslope Mound Height = Endslope Berm Width

3.00 ft X 4.0 ft = 12.1 ft

M. Calculate Mound Width: Upslope Berm Width + Bed Width + Downslope Berm Width

6.3 ft + 10.0 ft + 18.9 ft = 35.2 ft

N. Calculate Mound Length: Endslope Berm Width + Bed Length + Endslope Berm Width

12.1 ft + 63.0 ft + 12.1 ft = 87.2 ft

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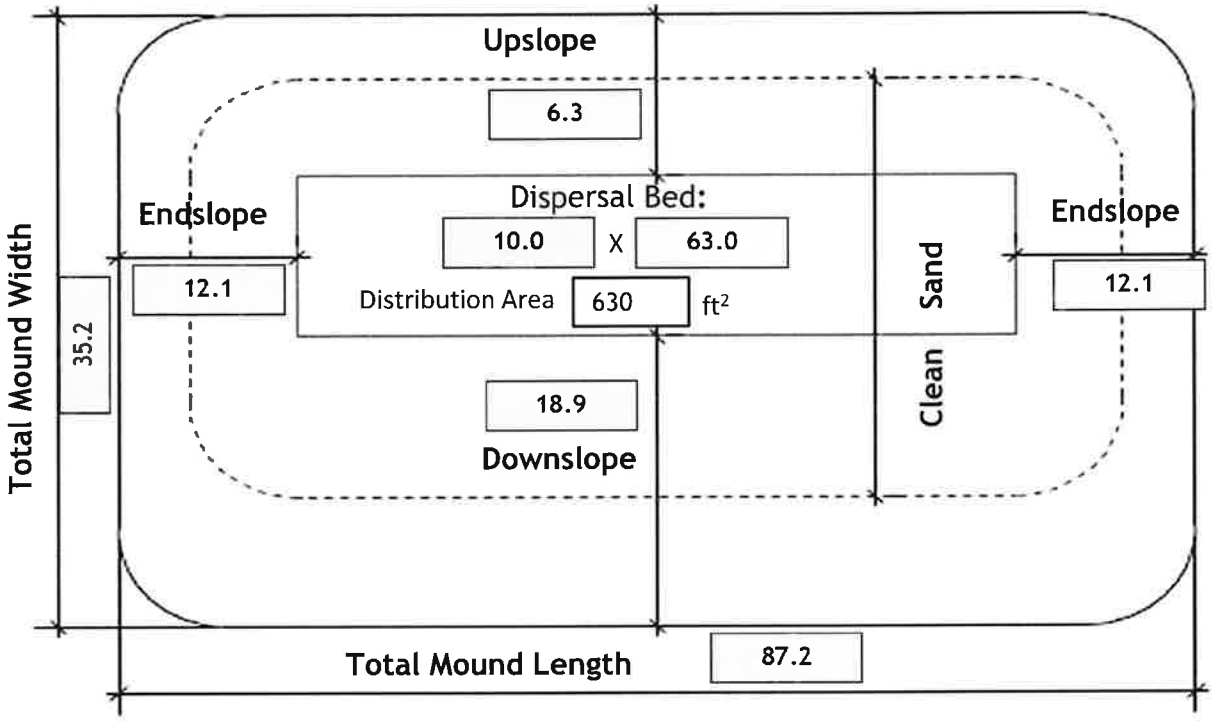
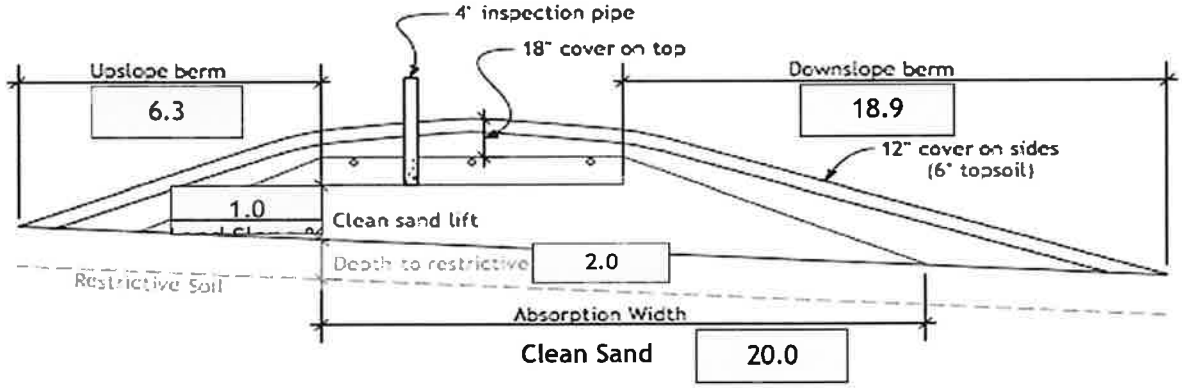
7. MOUND DIMENSIONS (Feet) Project ID:





Required Separation:	36 (in)	Distribution Media:	Rock
Manifold Connection:	End	Media Depth:	6.0 (in)
Perforation Size:	3/16 (in)	Perforation Spacing:	36.0 (in)

If Split and Non-Level Pressure Distribution Used: See Non-Level Pressure Distribution Form

Comments:

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ONSITE SEWAGE TREATMENT PROGRAM

Mound Materials Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

Project ID:

v 04.01.2021

A. Rock *Volume*: (Rock Below Pipe + Rock to cover pipe (*pipe outside dia + ~2 inch*)) X *Bed Length* X *Bed Width* = *Volume*

(6 in + 3.0 in) ÷ 12 X 63.0 ft X 10.0 ft = 472.5 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 472.5 ft^3 ÷ 27 = 17.5 yd^3

Add 30% for constructability: 17.5 yd^3 X 1.3 = 22.8 yd^3

B. Calculate *Clean Sand Volume:*

Volume Under Rock bed: *Average Sand Depth* x *Media Width* x *Media Length* = cubic feet

1.4 ft X 10.0 ft X ft = ft^3

For a Mound on a slope from 0-1%

Volume from Length = ((Upslope Mound Height - 1) X Absorption Width Beyond Bed X Media Bed Length)

ft - 1) X X ft =

Volume from Width = ((Upslope Mound Height - 1) X Absorption Width Beyond Bed X Media Bed Width)

ft - 1) X X ft =

Total Clean Sand Volume: *Volume from Length* + *Volume from Width* + *Volume Under Media*

ft^3 + ft^3 + ft^3 = ft^3

For a Mound on a slope greater than 1%

Upslope Volume: ((*Upslope Mound Height - 1*) x 3 x *Bed Length*) ÷ 2 = cubic feet

((2.8 ft - 1) X 3.0 ft X 63.0) ÷ 2 = 172.9 ft^3

Downslope Volume: ((*Downslope Height - 1*) x Downslope Absorption Width x *Media Length*) ÷ 2 = cubic feet

((4.0 ft - 1) X 10.0 ft X 63.0) ÷ 2 = 954.5 ft^3

Endslope Volume: (*Downslope Mound Height - 1*) x 3 x *Media Width* = cubic feet

(4.0 ft - 1) X 3.0 ft X 10.0 ft = 90.9 ft^3

Total Clean Sand Volume: *Upslope Volume* + *Downslope Volume* + *Endslope Volume* + *Volume Under Media*

172.9 ft^3 + 954.5 ft^3 + 90.9 ft^3 + ft^3 = 1218.3 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 1218.3 ft^3 ÷ 27 = 45.1 yd^3

Add 30% for constructability: 45.1 yd^3 X 1.3 = 58.7 yd^3

C. Calculate *Sandy Berm Volume:*

Total Berm Volume (approx): ((Avg. Mound Height - 0.5 ft topsoil) x Mound Width x Mound Length) ÷ 2

(3.4 - 0.5)ft X 35.2 ft X 87.2) ÷ 2 = 4490.0 ft^3

Total Mound Volume - Clean Sand volume -Rock Volume = cubic feet

4490.0 ft^3 - 1218.3 ft^3 - 472.5 ft^3 = 2799.2 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 2799.2 ft^3 ÷ 27 = 103.7 yd^3

Add 30% for constructability: 103.7 yd^3 x 1.3 = 134.8 yd^3

D. Calculate *Topsoil Material Volume: Total Mound Width X Total Mound Length X .5 ft*

35.2 ft X 87.2 ft X 0.5 ft = 1532.4 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 1532.4 ft^3 ÷ 27 = 56.8 yd^3

Add 30% for constructability: 56.8 yd^3 x 1.3 = 73.8 yd^3

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ONSITE SEWAGE TREATMENT PROGRAM

Pressure Distribution Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

Project ID: v 04.01.2021

1. Media Bed Width: 10 ft

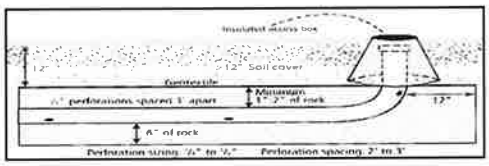
2. Minimum Number of Laterals in system/zone = Rounded up number of [(Media Bed Width - 4) ÷ 3] + 1.

   [(10 - 4) ÷ 3] + 1 = 3 laterals *Does not apply to at-grades*

3. Designer Selected *Number of Laterals*: 3 laterals
   Cannot be less than line 2 (Except in at-grades)

4. Select *Perforation Spacing*: 3.00 ft

5. Select *Perforation Diameter Size:* 3/16 in



6. *Length of Laterals* = Media Bed Length - 2 Feet.

   63.0 - 2ft = 61.0 ft *Perforation can not be closer then 1 foot from edge.*

7. Determine the *Number of Perforation Spaces*. Divide the *Length of Laterals* by the *Perforation Spacing* and round down to the nearest whole number.

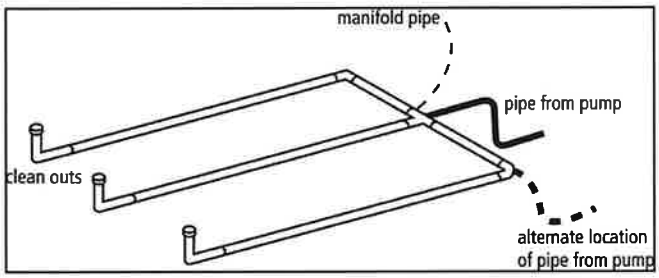
   Number of Perforation Spaces = 61.0 ft ÷ 3.0 ft = 20 Spaces

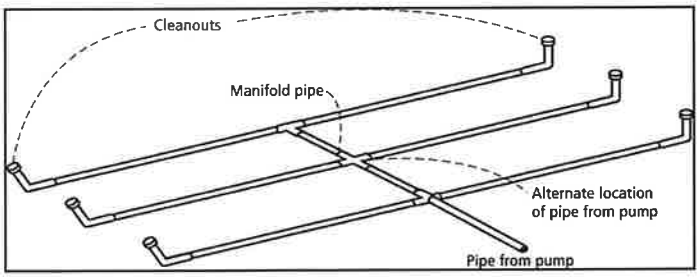
8. *Number of Perforations per Lateral* is equal to 1.0 plus the *Number of Perforation Spaces*. Check table below to verify the number of perforations per lateral guarantees less than a 10% discharge variation. The value is double with a center manifold.

   Perforations Per Lateral = 20 Spaces + 1 = 21 Perfs. Per Lateral

Maximum Number of Perforations Per Lateral to Guarantee <10% Discharge Variation

1/4 Inch Perforations						7/32 Inch Perforations					
Perforation Spacing (Feet)	Pipe Diameter (Inches)					Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3		1	1¼	1½	2	3
2	10	13	18	30	60	2	11	16	21	34	68
2½	8	12	16	28	54	2½	10	14	20	32	64
3	8	12	16	25	52	3	9	14	19	30	60
3/16 Inch Perforations						1/8 Inch Perforations					
Perforation Spacing (Feet)	Pipe Diameter (Inches)					Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3		1	1¼	1½	2	3
2	12	18	26	46	87	2	21	33	44	74	149
2½	12	17	24	40	80	2½	20	30	41	69	135
3	12	16	22	37	75	3	20	29	38	64	128





Design Summary Page

University of Minnesota Onsite Sewage Treatment Program

Pressure Distribution Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

9. *Total Number of Perforations* equals the *Number of Perforations per Lateral* multiplied by the *Number of Perforated Laterals.*

21	Perf. Per Lat. X	3	Number of Perf. Lat. =	63	Total Number of Perf.

10. Spacing of laterals; Must be greater than 1 foot and no more than 3 feet: 3.0 ft

11. Select *Type of Manifold Connection* (End or Center): End

12. *Select Lateral Diameter (See Table)* : 2.00 in

Design Summary Page

ONSITE SEWAGE TREATMENT PROGRAM

Pressure Distribution Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

13. Calculate the *Square Feet per Perforation.*

Recommended value is 4-11 ft2 per perforation, Does not apply to At-Grades

a. *Bed Area* = Bed Width (ft) X Bed Length (ft)

10	ft	X	63	ft =	630	ft^2

b. *Square Foot per Perforation* = *Bed Area* ÷ by the *Total Number of Perfs*

630	ft^2 ÷		63	perf =	10.0	ft^2/perf

14. Select *Minimum Average Head*: 2.0 ft

15. Select *Perforation Discharge* based on Table: 0.59 GPM per Perf

16. *Flow Rate* = *Total Number of Perfs X Perforation Discharge.*

63	Perfs	X	0.59	GPM per Perforation =	37 GPM

17. *Volume of Liquid Per Foot of Distribution Piping (Table II)*: 0.170 Gallons/ft

18. *Volume of Distribution Piping* =

= [*Number of Perforated Laterals* X *Length of Laterals* X (Volume of Liquid Per Foot of Distribution Piping]

3	X	61	ft	X	0.170	gal/ft =	31.1 Gallons

19. Minimum Delivered Volume = Volume of Distribution Piping X 4

31.1	gals	X	4	= 124.4 Gallons

Perforation Discharge (GPM)

Head (ft)	Perforation Diameter 1/8	3/16	7/32	1/4
1.0[a]	0.18	0.41	0.56	0.74
1.5	0.22	0.51	0.69	0.9
2.0[b]	0.26	0.59	0.80	1.04
2.5	0.29	0.65	0.89	1.17
3.0	0.32	0.72	0.98	1.28
4.0	0.37	0.83	1.13	1.47
5.0[c]	0.41	0.93	1.26	1.65
1 foot	Dwellings with 3/16 inch to 1/4 inch perforations			
2 feet	Dwellings with 1/8 inch perforations			
	Other establishments and MSTS with 3/16 inch to 1/4 inch perforations			
5 feet	Other establishments and MSTS with 1/8 inch perforations			

Table II Volume of Liquid in Pipe

Pipe Diameter (inches)	Liquid Per Foot (Gallons)
1	0.045
1.25	0.078
1.5	0.110
2	0.170
3	0.380
4	0.661

Comments/Special Design Considerations:

Design Summary Page

ONSITE SEWAGE TREATMENT PROGRAM

Basic Pump Selection Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. PUMP CAPACITY Project ID: v 04.01.2021

Pumping to Gravity or Pressure Distribution: Pressure

A. If pumping to gravity enter the gallon per minute of the pump: ____ GPM *(10 - 45 gpm)*

B. If pumping to a pressurized distribution system: 37.0 GPM

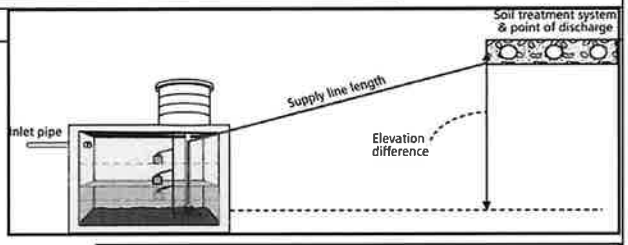
C. Enter pump description: Equalization/Time Dosing

2. HEAD REQUIREMENTS

A. Elevation Difference between pump and point of discharge: 17 ft

B. Distribution Head Loss: 6 ft

C. Additional Head Loss: ____ ft (due to special equipment, etc.)



Distribution Head Loss	
Gravity Distribution = 0ft	
Pressure Distribution based on Minimum Average Head Value on Pressure Distribution Worksheet:	
Minimum Average Head	**Distribution Head Loss**
1ft	5ft
2ft	6ft
5ft	10ft

Table I. Friction Loss in Plastic Pipe per 100ft

Flow Rate (GPM)	Pipe Diameter (inches)			
	1	1.25	1.5	2
10	9.1	3.1	1.3	0.3
12	12.8	4.3	1.8	0.4
14	17.0	5.7	2.4	0.6
16	21.8	7.3	3.0	0.7
18		9.1	3.8	0.9
20		11.1	4.6	1.1
25		16.8	6.9	1.7
30		23.5	9.7	2.4
35			12.9	3.2
40			16.5	4.1
45			20.5	5.0
50				6.1
55				7.3
60				8.6
65				10.0
70				11.4
75				13.0
85				16.4
95				20.1

D. 1. Supply Pipe Diameter: 2.0 in

2. Supply Pipe Length: 110 ft

E. **Friction Loss in Plastic Pipe per 100ft** from Table I:

Friction Loss = 3.50 ft per 100ft of pipe

F. Determine *Equivalent Pipe Length* from pump discharge to soil dispersal area discharge point. Estimate by adding 25% to supply pipe length for fitting loss.
Supply Pipe Length X 1.25 = *Equivalent Pipe Length*

110 ft X 1.25 = 137.5 ft

G. Calculate *Supply Friction Loss* by multiplying *Friction Loss Per 100ft* by the *Equivalent Pipe Length* and divide by 100.

Supply Friction Loss =

3.50 ft per 100ft X 137.5 ft ÷ 100 = 4.8 ft

H. *Total Head* requirement is the sum of the *Elevation Difference* + Distribution Head Loss, + Additional Head Loss + Supply Friction Loss

17.0 ft + 6.0 ft + ____ ft + 4.8 ft = 27.8 ft

3. PUMP SELECTION

A pump must be selected to deliver at least **37.0** GPM with at least **27.8** feet of total head.

Comments:

Design Summary Page

ONSITE SEWAGE TREATMENT PROGRAM

Pump Tank Design Worksheet (Time Dose)

MINNESOTA POLLUTION CONTROL AGENCY

DETERMINE TANK CAPACITY AND DIMENSIONS Project ID: v 04.01.2021

1. A. *Design Flow (Design Sum. 1A) :* 750 GPD B. Tank Use: **Dosing**
   C. Percentge of Design Flow 70 % 525 Gal Up to 75% design flow is normal for Design percentage
   D. Min. required pump tank capacity: Gal E. Recommended capacity: 1820 Gal

2. A. Tank Manufacturer: Jacobson B. Tank Model: 1820 Molehole
   C. Capacity from manufacturer: 1785 Gallons
   D. Gallons per inch: 43.0 Gallons per inch
   E. Liquid depth of tank from manufacturer: 41.5 inches

Note: Design calculations are based on this specific tank. Substituting a different tank model will change the pump float or timer settings. Contact designer if changes are necessary.

DETERMINE DOSING VOLUME

3. *Volume to Cover Pump* (The inlet of pump should be 4 in from the bottom of the tank & 2 in covering the pump recommended)
   (Pump and block height + 2 inches) X *Gallons Per Inch*
   (12 in + 2 inches) X 43.0 Gallons Per Ir = 602 Gallons

4. *Minimum Delivered Volume* = 4 X Volume of Distribution Piping:
   -Item 18 of the Pressure Distribution or Item 11 of Non-level 124 Gallons (minimum dose) 2.9 inches/dose

5. Calculate *Maximum Pumpout Volume* (25% of Design Flow)
   Design Flow: 750 GPD X 0.25 = 188 Gallons (maximum dose) 4.4 inches/dose

6. *Select a pumpout volume that meets both Minimum and Maximum:* 125 Gallons

7. Calculate *Doses Per Day* = Percentage Design Flow ÷ *Delivered Volume*
   525 gpd ÷ 125 gal = 4.2 *Doses*

8. Calculate Drainback:
   A. *Diameter of Supply Pipe* = 2 inches
   B. Length of Supply Pipe = 110 feet
   C. *Volume of Liquid Per Lineal Foot of Pipe* = 0.170 Gallons/ft
   D. *Drainback = Length of Supply Pipe X Volume of Liquid Per Lineal Foot of Pipe*
   110 ft X 0.170 gal/ft = 18.7 Gallons

9. *Total Dosing Volume = Delivered Volume* plus *Drainback*
   125 gal + 18.7 gal = 144 Gallons

10. Working Storage Volume = Tank Volume -Volume to Cover Pump - Reserve Capacity
    1785 gal - 602 gal - 535 = 648 Gallons

Volume of Liquid in Pipe	
Pipe Diameter (inches)	**Liquid Per Foot (Gallons)**
1	0.045
1.25	0.078
1.5	0.110
2	0.170
3	0.380
4	0.661

11. Required *Flow Rate* :
    A. From Pump Curve - Must verify after Install: 37 GPM*
    B. Calculated GPM = Change in Depth (in) x Gallons Per Inch / Time Interval in Minutes
    in X 43.0 gal/in ÷ min = GPM

12. Select Flow Rate from Line 11.A or 11.B: 37.0 GPM*

Note: This value must be adjusted after installation based on pump calibration.

Design Summary Page

ONSITE SEWAGE TREATMENT PROGRAM

Pump Tank Design Worksheet (Time Dose)

MINNESOTA POLLUTION CONTROL AGENCY

NORMAL OPERATION TIMER SETTINGS*

13. Calculate **TIMER ON** setting*:

Total Dosing Volume		÷ GPM				HR	MIN	SEC
144	gal	÷ 37.0	gpm	= 3.9	Minutes **ON***	0	3.0	53

14. Calculated **TIMER OFF** setting*:

Minutes Per Day (1440)/*Doses Per Day*		- Minutes On				HR	MIN	SEC
1440 min ÷	4	doses/day -	3.9	min =	339.0 Minutes **OFF***	5	38.0	59

OPTIONAL PEAK ENABLE DOSING* - *Desingers option for peak flow operation*

15. Peak Percentage of Design Flow ____ %

16. Peak Pump Volume that meets both Minimum and Maximum Volume ____ gal + DrainBack 18.7 gal

17. Peak Dose Volume ____ gal

18. Peak TIMER ON ____ gal ÷ ____ gpm = ____ min ON — HR ____ MIN ____ SEC ____

**Note: This value must be adjusted after installation based on pump calibration.*

19. Peak TIMER OFF:1440 min ÷ ____ doses/day - ____ min On ____ min Off — HR ____ MIN ____ SEC ____

FLOAT SETTINGS

20. Pump Off Float - Measuring from bottom of tank:

Distance to set Pump Off Float=Gallons to Cover Pump / Gallons Per Inch:

602 gal ÷ 43.0 gal/in = 14.0 Inches

Reserve Capacity **535 Gal**

Alarm Depth 29.1 in — **648 Gal**

21. Alarm Float - Measuring from bottom of tank (90% recommended):

Distance to set Alarm Float = Tank Depth X % of Tank Depth (90% recommended)

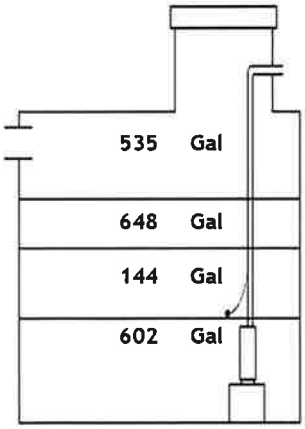
41.5 in X 70 % = 29.05 Inches

Normal Dose Volume **144 Gal**

Pump Off 14.0 in — **602 Gal**

22. Reserve Capacity in gallons = (Tank Depth - Alarm Depth) X GPI

(41.5 in + 29.1 in) X 43.0 = 535.4 gallons



SOIL INFORMATION

Soil Observation Log

Property Owner	PRAIRIE RIVER RETREAT	**Property Address**	51272 LAKE AVE MCGREGOR, MN 55760

Soil parent material(s): (Check all that apply) ☑ Outwash ☐ Lacustrine ☐ Loess ☐ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter

Landscape Position: (check one) ☐ Summit ☐ Shoulder ☑ Back/Side Slope ☐ Foot Slope ☐ Toe Slope

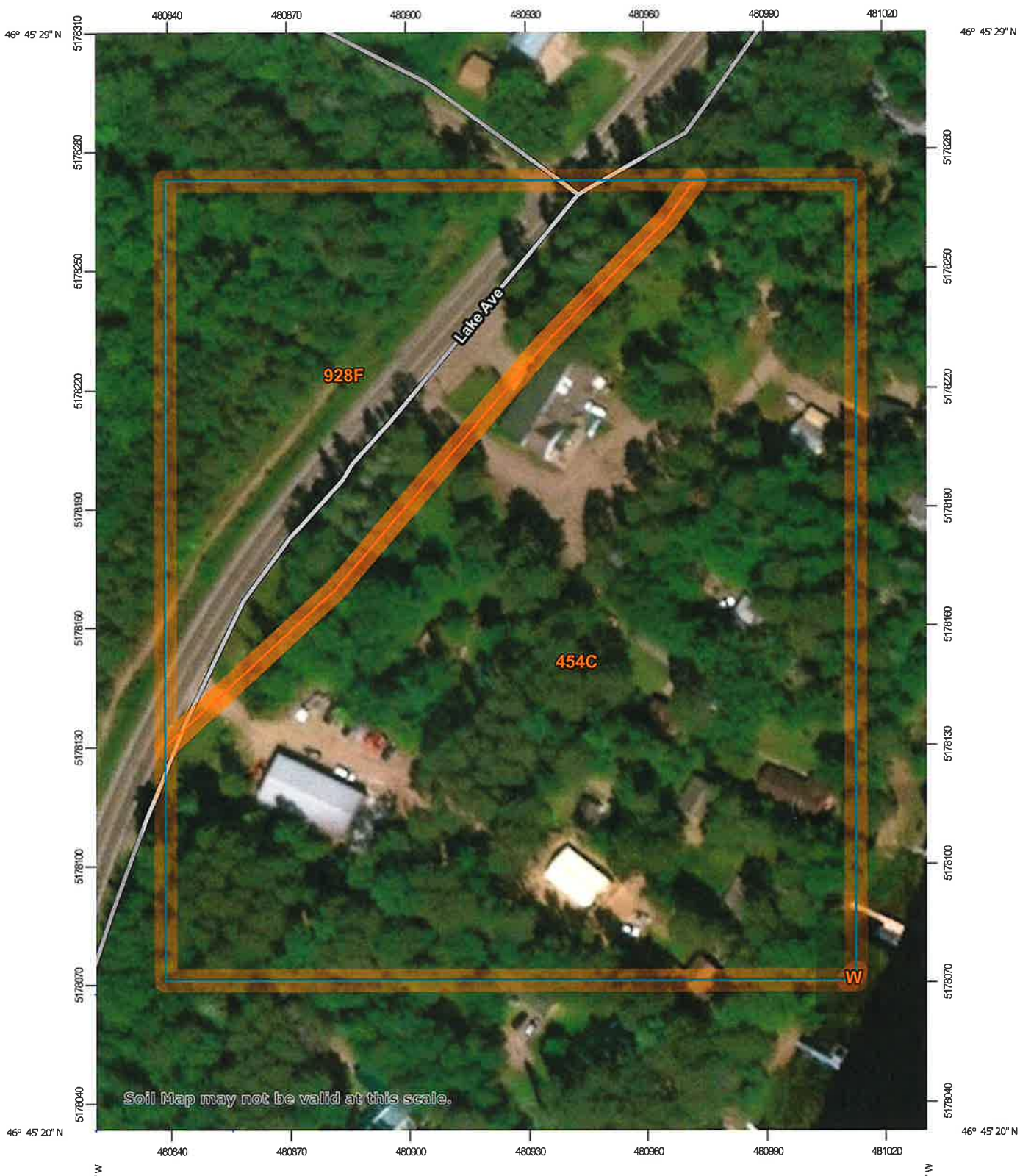
Vegetation	WOODS	**Soil survey map units**	454C - MAHTOMEDI LOAMY COARSE SAND
Weather Conditions/Time of Day:	SUNNY	**Date**	09/09/21

Observation #/Location:	Soil Boring 1	Observation Type:	Auger

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)		Mottle Color(s)		Redox Kind(s)	Indicator(s)	I-------- Structure----------I		
									Shape	Grade	Consistence
0" - 9"	Loamy Sand	<35%	10YR	4/3					Granular	Strong	Friable
9" - 28"	Loamy Sand	<35%	10YR	5/4					Granular	Strong	Friable
28" - 30"	Loamy Sand	<35%	10YR	5/4	10YR	5/8	Concentrations	S2	Granular	Strong	Friable
Observation #/Location:		Soil Boring 2						Observation Type:		Auger	
0" - 6"	Loamy Sand	<35%	10YR	4/3					Granular	Strong	Friable
6" - 9"	Loamy Sand	<35%	10YR	6/3					Granular	Strong	Friable
9" - 28"	Silt Loam	<35%	10YR	6/3					Granular	Strong	Friable
28" - 30"	Silt Loam	<35%	10YR	6/3	10YR	5/8	Concentrations	S2	Granular	Strong	Friable
Observation #/Location:		Soil Pit						Observation Type:		Auger	
0" - 8"	Loamy Sand	<35%	10YR	4/3					Granular	Strong	Friable
8" - 12"	Loamy Sand	<35%	10YR	6/3					Granular	Strong	Friable
12" - 28"	Silt Loam	<35%	10YR	6/3					Granular	Strong	Friable
28" - 30"	Silt Loam	<35%	10YR	6/3	10YR	5/8	Concentrations	S2	Granular	Strong	Friable
Comments											

I hereby certify that I have completed this work in acc rdinances, rules and laws.

Eric Otte	Eric Otte		**2624**	**9/9/2021**
(Designer/Inspector)			(License #)	(Date)



Map Scale: 1:1,350 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Aitkin County, Minnesota
Survey Area Data: Version 21, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

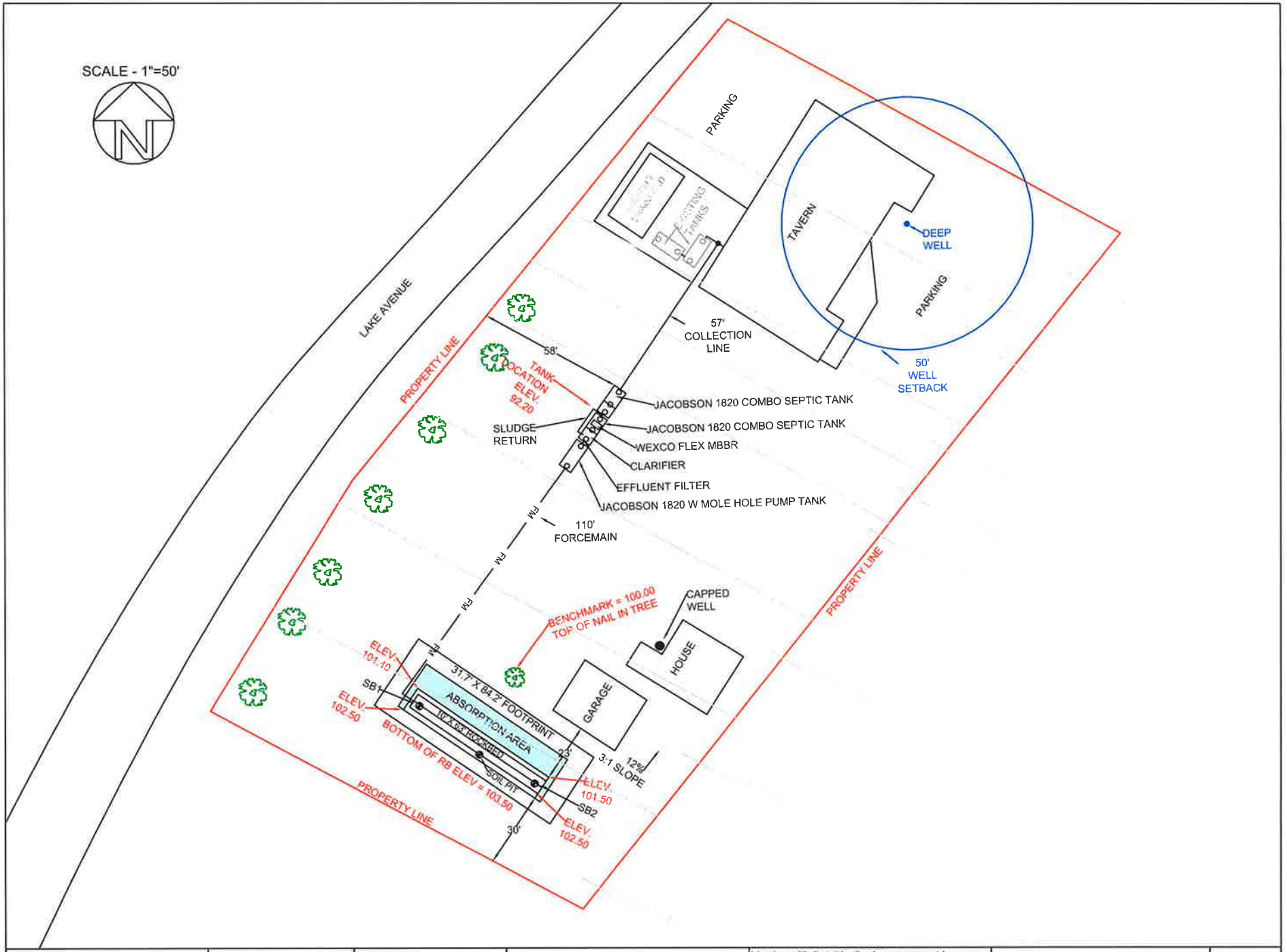
Date(s) aerial images were photographed: May 19, 2014—Aug 23, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
454C	Mahtomedi loamy coarse sand, 6 to 12 percent slopes	6.3	71.9%
928F	Cushing-Mahtomedi complex, 25 to 40 percent slopes	2.4	28.1%
W	Water	0.0	0.0%
Totals for Area of Interest		**8.7**	**100.0%**

SITE PLANS



PREPARED FOR:	PROPERTY LOCATION	LEGAL DESCRIPTION	SEPTIC CHECK		PAGE TITLE	SHEET NUMBER
PRAIRIE RIVER RETREAT	51272 LAKE AVENUE MCGREGOR, MN 55760	Aitkin County, Minnesota PID# 29-1-370500	8074 KEYSTONE RD MILACA, MN 56353 (320)-983-2447 (FAX) (320)-983-2151	I hereby certify that this site plan was prepared by me or under my direct supervision. Brian Koski M. P. C. A. License # 2624 DATE 5/3/23	Septic Design Site Map	1 OF 1

ArcGIS Web Map

1:1,128 0 0.005 0.01 mi 1 inch = 94 feet

Web AppBuilder for ArcGIS

Aitkin County

Date: 4/24/2023

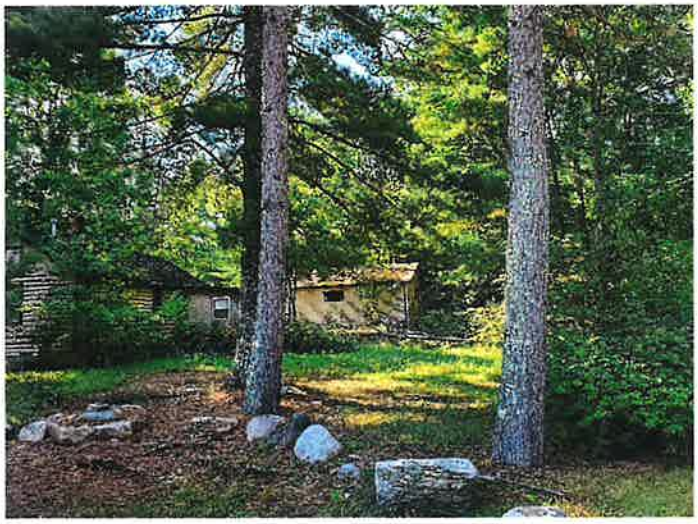
SEPTIC CHECK

EXPERT SERVICE. LASTING VALUE. CLEAN WATER

51272 Lake Ave McGregor, MN 55760

Existing Drainfield

Existing Tanks



Home & Garage on PID 's
29-1-370900
29-1-271000

View from staked drainfield to new
Tank location

SEPTIC CHECK

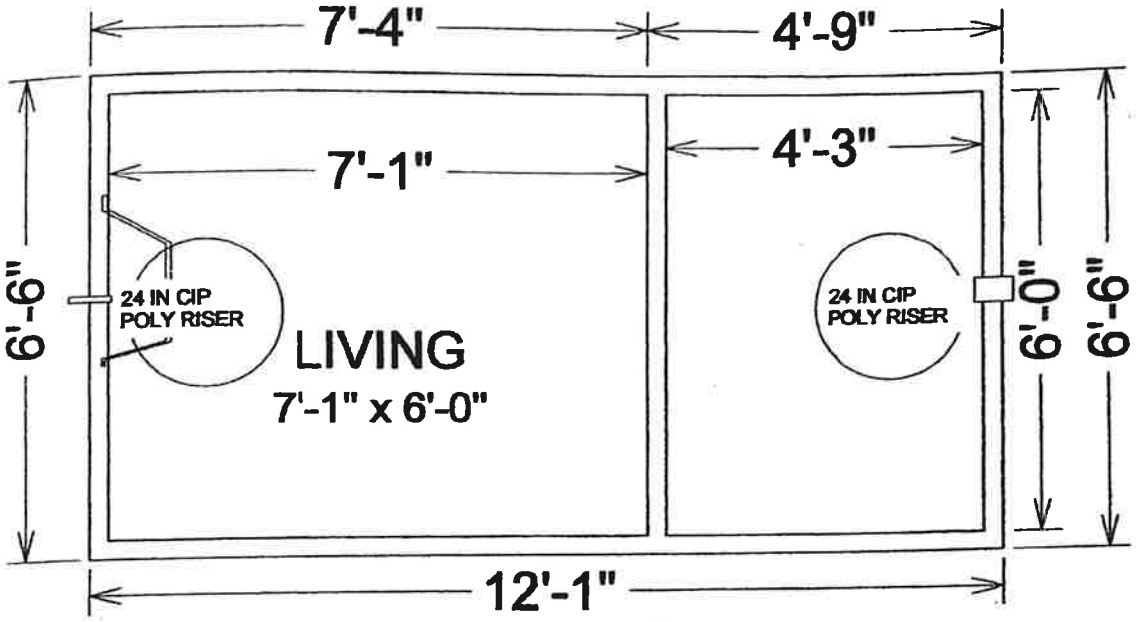
EXPERT SERVICE. LASTING VALUE. CLEAN WATER

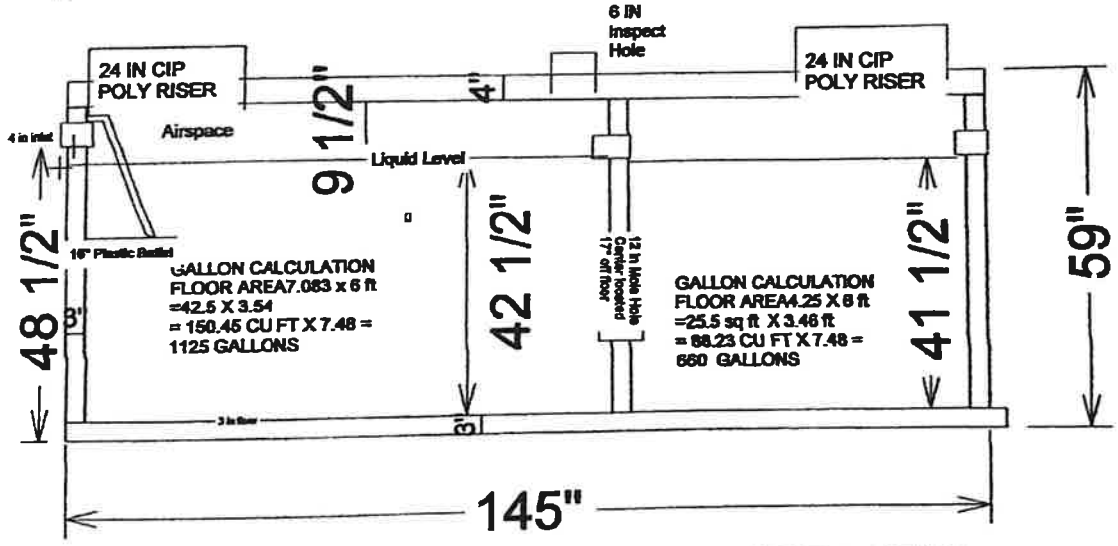
Staked drainfield west side
of garage

Benchmark = Top of nail in Tree

1820 SSMH 2 Compartment Septic/Septic Tank W Mole Hole

TOP VIEW

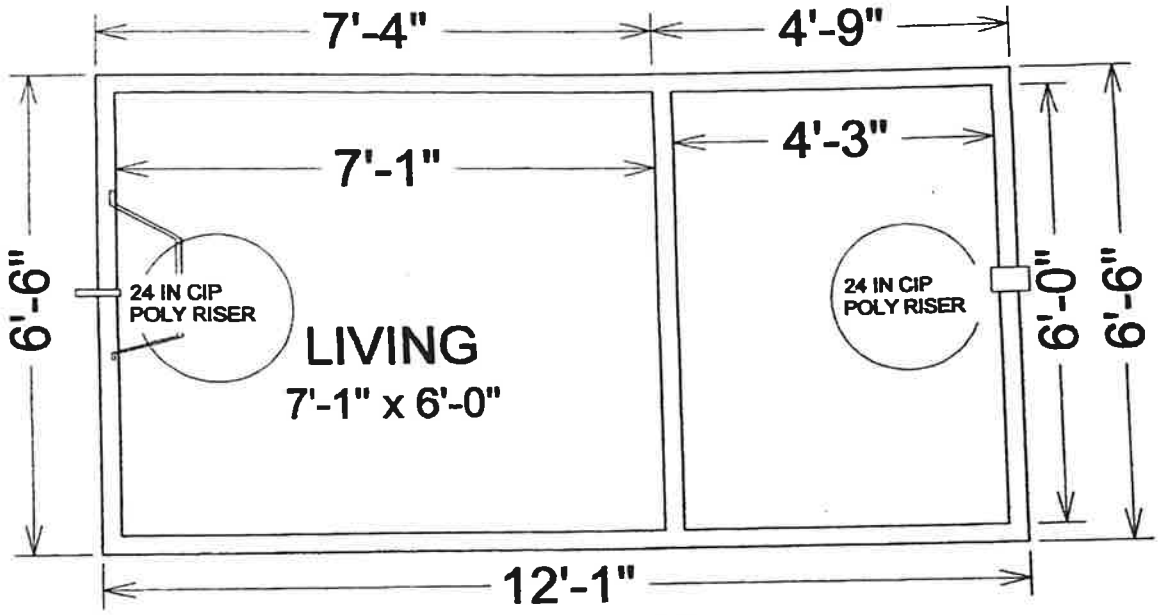


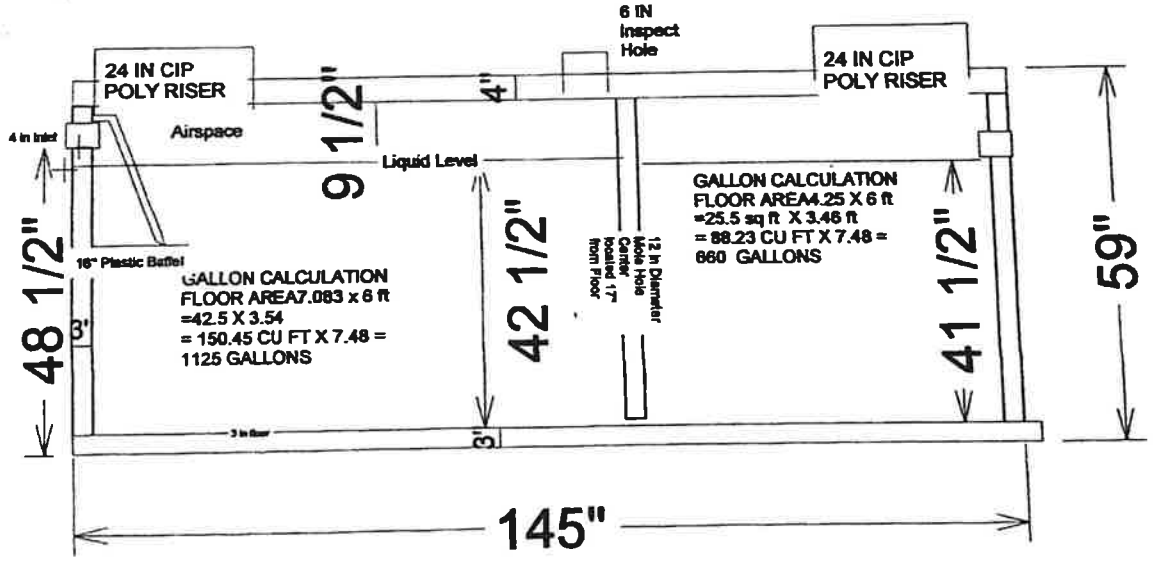


SIDE VIEW

1820 HMH 2 Compartment Holding Tank W Mole Hole

TOP VIEW

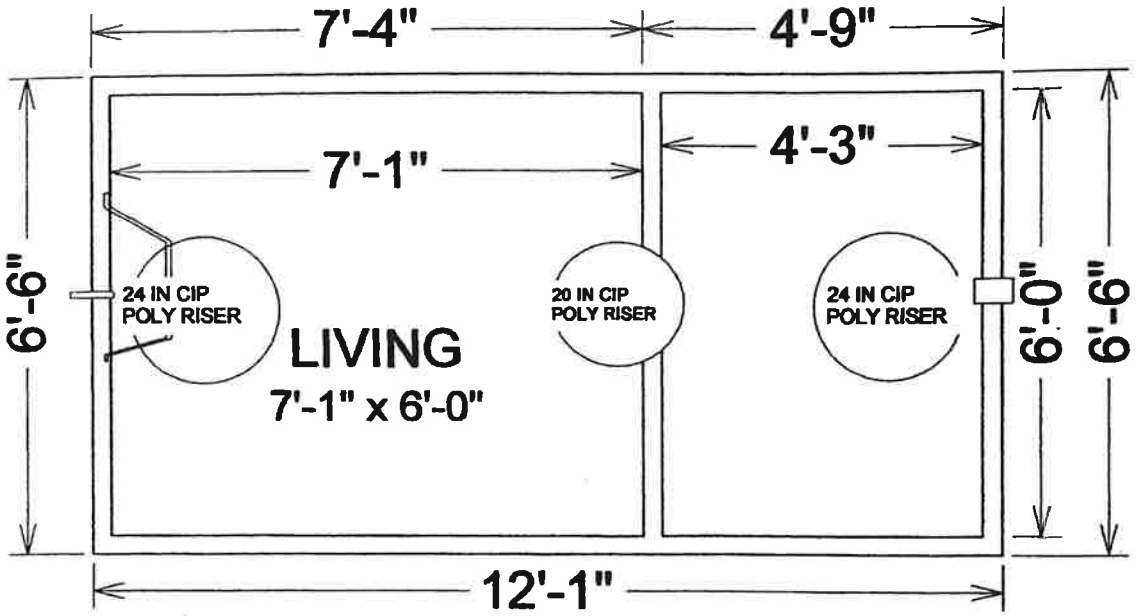


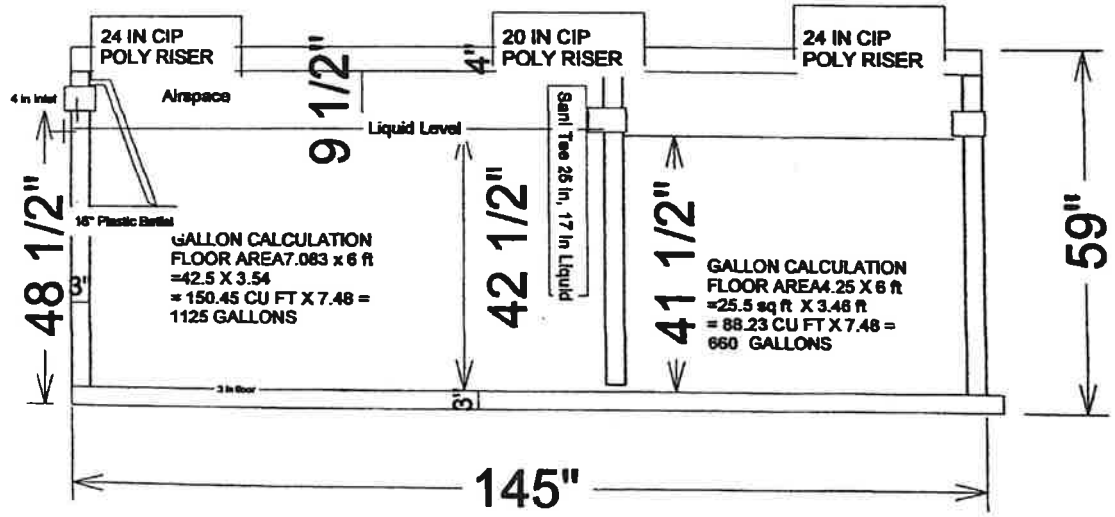


SIDE VIEW

1820 SP 2 Compartment Septic/ Septic Tank

TOP VIEW





SIDE VIEW